

## MGDUFF Summary:

### What is Accelerated Low Water Corrosion?

Unprotected steel, in particular sheet piling and tubular support piles, are experiencing rapid decay and failing well within their original design life. Typically systems 25 – 30 years old are showing significant deterioration due to ALWC and galvanic action. It varies in intensity depending on local variables but is generally defined as:

*“The localised and aggressive corrosion that typically occurs at or below low-water level and is associated with microbially induced corrosion”*

### What is Microbial Corrosion?

Bugs! Microbial corrosion, also called microbially induced corrosion (MIC), is corrosion caused or promoted by micro-organisms. It can apply to both metallic and non-metallic materials. Admittedly this is pretty high science, but we do know that application of sacrificial anodes can arrest or substantially reduce the effects of this phenomenon.

### How serious is it?

ALWC corrosion rates can be very high, leading to tubular piles breaking or the leaching out of backfill from sheet piling causing subsidence in the wharf below.



### What to do?

Help is at hand - there are several methods to treat, repair and prevent ALWC, including coating, wrapping, plating/welding, but particularly effective is sacrificial anode cathodic protection.

Operators and owners are now strongly advised to include cathodic protection on all maritime structures, however current national codes do not provide guidance on ALWC with the exception of British Standard Institution (BSI) Maritime Structures Code **BS 6349-1 (2000)**, which provides a general description and warnings.

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### • Tubular Piles

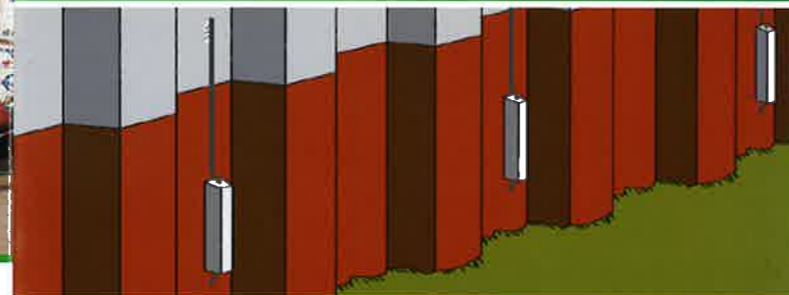
Where access for attaching the anodes is restricted, one solution can be bracelet anodes (anodes mounted to a steel ring assembly) designed specifically to suit the exact pile diameter. Fabrication of the bracelets can be effected onshore then installed as a complete set below water.

MGDuff have also developed anodes that remove the need for underwater welding and diving, and simplify the installation process. This system makes use of a tank anode, which is typically longer and thinner than a hull anode, and has a higher output. Fitted with a cranked and elongated core bar, which extends above tidal level, the anode can be dry welded to the pile from a pontoon.

Each pile has its own current demand so the requirement for an effective Cathodic Protection (CP) scheme can range from single to multiple sets of anodes per pile. Multiple anodes are normally mounted equispaced around the circumference and set at a depth that ensures the anodes remain submerged at all points of the tide.

### • Sheet Piling

By nature of sheet piling design, long runs are intrinsically linked therefore the whole structure has to be taken into account when calculating the anode requirement. The same design of tank anode as detailed above may be fitted above waterline, or underwater welded should conditions and facilities permit. Anodes are usually attached to the “in-pan” area to avoid attrition damage from debris or vessels mooring alongside.



### Inspection.

After installation is complete MGDuff arrange a cathodic protection survey with a reference cell to ensure the potentials have reached the required level. Further through-life surveys may be requested by the client.

### Testing and Reporting.

MGDuff can arrange for thickness testing of existing structures as well as visual inspections to give asset managers a clearer picture of deterioration. Of course there are two sides to every story as sheet piling corrodes from the landfill side as well, so we strongly advise specialist inspection of this area, especially the tie-bars.

### A Practical Approach.

The above proposals are made using known technology and proven installation methods, taking into consideration the client's own capabilities and equipment. This practical

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approach can substantially reduce the need to bring in specialised contractors thus keeping costs to a minimum. All MGDuff calculations for the life of the scheme are in accordance with industry standards laid down for such purposes.

### Why MGDuff?

Established in 1954, MGDuff is the UK's oldest and most experienced cathodic protection company. We set the standards to protect ships and small craft from corrosion, and sixty years on these are still the accepted principles used on today's vessels. Along this journey sacrificial anode methodology and knowledge gained has been equally applied to in-water structures.

### Industrial and Civil Engineering

MGDuff industrial cathodic protection systems are specified and fitted worldwide on lock gates, sheet and tubular piling, marinas, link-spans, jetties, breakwaters and piers. Developing technologies such as subsea renewable energy projects are protected by MGDuff anodes.

### Cathodic Protection Design

MGDUFF design Cathodic Protection (CP) schemes and supply sacrificial anodes for ports, docks and harbours. Whereas in the past cathodic protection was an afterthought or considered unnecessary, through-life protection against corrosion is now an important part of asset management. All new infrastructure projects have CP specified as an integral part of the design.

### Manufacturing

MGDuff sacrificial anodes in zinc, aluminium and magnesium are manufactured in accordance with internationally approved specifications using the highest purity ingredients, and ISO quality Management Systems.

